Amendments to the Specification:

1. Please amend the Specification Page 10, Paragraph 1, and Lines 7 to 12 as follows:

~~For example,~~ FIGURE 4 is a schematic view of a process 400 ~~process~~ for evaluating and assessing performance of a neural network inverse model in accordance with another embodiment of the invention. In this embodiment, the process 400 includes providing vibration data at a plurality of locations on the aircraft engine, specifically, at a fan vibration sensor 402 and a low pressure turbine sensor 404. Trial engine unbalance data are also are provided, including trial fan unbalance data 406 and trial LPT unbalance data 408.

2. Please amend the Specification Page 13, Paragraph 1, and Lines 13 to 15 as follows:

In the above equations, R(n) is a diagonal N_L-by-N_L matrix, whose diagonal components are equal to or slightly less than 1. H(n) is an M-by-N_L matrix containing the partial derivatives of the output node signals with respect to the weights. P(n) is an M-by-M matrix defined as the approximate conditional error covariance matrix. A(n) is a N_L-by-N_L matrix that we refer to as the global scaling matrix. K(n) is an M-by-N_L matrix containing the Kalman gains for the weights. $\hat{W}(n)$ is a vector of length M containing the all the weights values. $\xi(n)$ is the error vector of the network's output layer. ~~While the motivation for the use of artificial process noise in equation~~ Equation (6) uses artificial process noise ~~was~~ to avoid numerical difficulties, ~~we have found in addition that it~~ and to significantly enhances the performance of the GEKF algorithms in terms of rate of convergence, avoidance of local minimum and quality of solution.

3. Please amend the Specification Page 18, Paragraph 2, and Lines 16 to 25 as follows:

Methods and systems for analyzing engine unbalance conditions may provide significant advantages over the prior art. For example, embodiments of methods including neural network inverse models in accordance with the present invention may provide improved characterization and diagnosis of engine vibrational data and acoustic noise data, particularly data including

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significant non-linear components. Since neural network inverse models are equally ~~application~~ applicable to both linear and non-linear vibrational problems, methods and systems incorporating such models are better equipped to analyze vibrational data including non-linear components. Furthermore, embodiments of methods and systems in accordance with the invention may provide improved engine balance solutions in comparison with the prior art methods that target the reduction of vibrational displacement at only two locations, particularly for applications where numerous alternate flow paths for vibrational energy may be significant.

4. Please amend the Specification Page 18, Paragraph 3, Lines 26 to 31, and Page 19, Lines 1 to 9 as follows:

It should be noted that the construction of an artificial neural network using back-propagation uses "input" and "output" terminology that are the reverse of what would be viewed as input and output from an overall process. To be more precise, when using back-propagation, the vibration data from the sensors is the output to the artificial neural network, and the input is the unbalance. The desired solution, in this case the unbalance magnitudes and angular locations, are ~~backpropagated~~ back propagated, or solved for. This terminology is consistent with the concept of neurons and how neurons interact in a downstream sense. However, if one places a control volume around the entire process of acquiring data, supplying it to a neural network, and extracting useful information, the vibration data is the input to the control volume, and the output is the unbalance information. This distinction is drawn so as to establish more precise terminology for the claims, where an artificial neural network control volume, or ANNCV, shall refer to the entire data processing package control volume, irrespective of back-propagation or some other method of internal solution. The ANNCV shall be inclusive and independent of whether inverse back propagation models, Kalman filter Models, or Support Vector Machine models are used.

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